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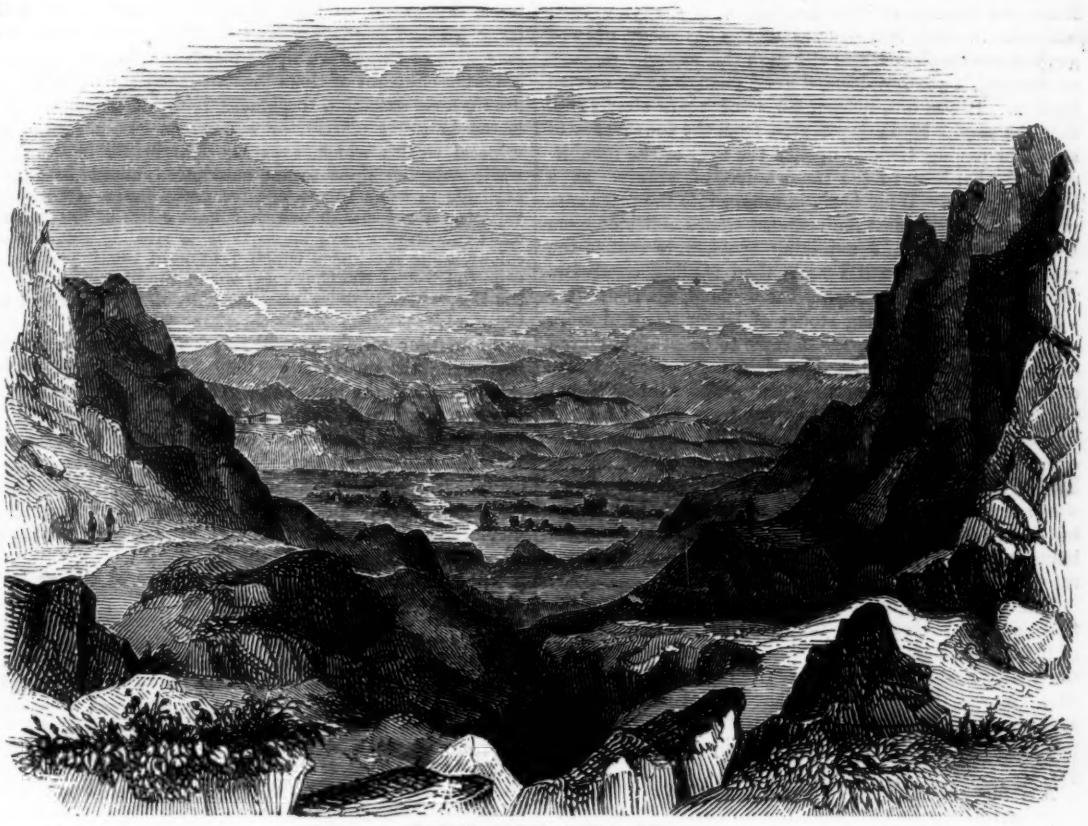
THE GRANITE QUARRIES OF ABERDEEN.



GRANITE ROCKS—CAIRN GORM.

I.

In every state of civilized society the cultivation of the soil is of the first importance; next to this the mineral riches of the earth claim particular attention. It is soon discovered in every community, that gems and the precious metals are not the really valuable subjects of attention, but that more humble and more extensively diffused substances are necessary to our well-being. Of these, iron and coal occupy the highest rank as the great civilizers of man; then those building-stones with which he constructs and adorns his dwelling: by far the most important of these are granite, calcareous rocks, sandstone, and slate.

Granite is not distributed over very extensive tracts in any part of the globe, yet Scotland possesses a greater variety and abundance than most parts of Europe, and is, perhaps, scarcely excelled by Egypt and Nubia.

Granite appears for the most part in the highest and most central parts of mountainous tracts; but it is sometimes found in the lowest situations, and on the coasts of the ocean. It is always composed of fragments of crystals more or less completely aggregated together without any cementing substances. Of these crystals by far the greater number consist of *felspar;* next in proportion is *quartz;* and there is usually a smaller number of crystals of *mica,* or *horneblende.* The felspar varies in colour; but it is usually white or red, and to this circumstance is due the prevailing tint of the stone. The mica is not an essential ingredient: it is often present in small quantities, or it is wanting altogether, its place being supplied by horneblende, in which case the stone is no longer called Granite, but *Syenite,* from *Syene,* a town of Egypt, the neighbourhood of which abounds in that variety of granite.

In the extensive quarries of Aberdeen the granite appears in distinct concretions of great magnitude, in which the same layers may be seen spreading like the coats of an onion. The central portion of such a mass, or concretion, called by the workmen *poot,* is the valuable part of the rock. The external parts are called *drys,* from their shivery and less coherent nature.

The history of the granite quarries of Aberdeen presents a curious illustration of the common prejudice which often leads people to despise the rough materials by which they are surrounded, and to seek elsewhere for that which can be had much better at home. Previously to the year 1730, the buildings of Aberdeen were constructed of the rounded outlying masses of granitic rocks scattered all round the place, over ground then of the most barren description. There were a few exceptions, such as the East and West Churches, which were built of sandstone regularly squared and brought from a

distance. The only ancient specimen of dressed granite is seen in the nave of the Cathedral of Old Aberdeen, (erected 1522,) which is still entire; its western front and two stone spires are of a red granite of large grains, very rudely cut, and with almost no ornament. The interior of the nave and the columns are of a reddish sandstone of inferior quality. The first building of any large size erected in Aberdeen with dressed or square stones of granite was Gordon's Hospital, commenced in 1739, and even in this case sandstone was employed to form the lintels and facings. In 1755, the new West Church was built of a very bad iron-shot sandstone from the vicinity of Dundee, which is decaying fast; while for the first two courses of the basement, dressed granite was employed, and although this material remains unchanged, it was not deemed good enough to be carried farther. It was not, indeed, till some years after 1760, that the profits beginning to arise from the conveyance of stone for paving London opened the eyes of the inhabitants of Aberdeen to the importance of granite as a building-stone. What brought money into the place rose in estimation. At first the rounded stones collected from the Bay of Nigg and adjoining spots, were sent to the metropolis in the small vessels then trading coastwise. When these ceased to supply the demand, quarries were opened to furnish paving stones of larger size and more regular shape. By degrees it came to be generally used as a building material. The first cornice and frieze and architrave, executed in granite, was in 1801; but workmen could not then be found to undertake the dressing of balusters in that material; they were executed in sandstone, and painted in imitation of the harder granite. Three years afterwards a balustrade was executed at the high rate of 27*s.* 4*d.* per piece; but in 1816, no difficulty was found in forming the balustrade of Waterloo Bridge at a considerably lower rate.

The extensive quarries of Rubislaw were among the first opened at Aberdeen: they are situated at a distance of little more than a mile from the city. They produce the yearly rent of 130*l.*, and are the best in this vicinity. Mr. George Rennie found that a half-inch cube of Rubislaw granite required to crush it a force of 24,556 pounds. This force was supplied by the hydrostatic press.

A similar cube of Peterhead granite was

crushed with a force of		18,636	pounds.
"	" of Cornish granite	14,302	"
"	" Craigleith freestone	12,346	"
"	" Portland stone	9,776	"
"	" Red brick	1,817	"

The excavations at Rubislaw are assuming a gigantic aspect. The goodness of the stone increases the lower it is wrought, the fissures becoming less numerous, and the quantity of *drys*, or soft granite, not so great as near the surface. The water of the quarry is drained off by means of a large syphon.

Three or four miles from Aberdeen are situated the Dancing Cairn quarries. They are placed on the side of an eminence, and are thus easily drained; but this facility seems to have encouraged the early workers to commence at too high a level, the consequence of which has been the formation of such piles of rubbish as cannot be removed on account of the great expense. The granite here differs from that of Rubislaw in having larger felspar crystals, which, though detracting somewhat from its strength, improves its appearance when dressed. Hence it is not uncommon in Aberdeen for persons about to erect houses, to stipulate that the stone for the fronts shall be from the Dancing Cairns quarry.

By far the greater part of the best granite used in, and exported from, Aberdeen, is from the above-named quarries. There are many other quarries in the vicinity which need not be particularized: some of them are discontinued, except when a supply is required by the proprietor, or a sudden demand arises in the export trade.

On ascending the valleys of the Esks, the Dee, or the Don, a great elevation is attained near their sources, and the Grampians (the Aberdeenshire Alps, as they have been significantly called,) appear, which supply the highest elevations in the island. Many of these enormous masses rise more than four thousand feet above the level of the sea, and are composed of red granite throughout. These mountains present, on their north-east sides, precipices of semicircular shapes, termed in Gaelic *choires*. On their summits, and for some distance downward on their sides, the granite rocks and large grained sands are barren of vegetation, with the exception of those rare alpine plants which grow at great heights. Several of them present many square miles of nearly level summits, the blocks lying on which, or collected in great masses, or *cairns*, present a source of mineral wealth which, says Dr. Knight, "I have often while enjoying these scenes anticipated might be made available in some future age for useful ends. Of all the varieties of red granite which I have collected in this and other countries, I have found none to rival in richness of colour, some specimens which I brought many years ago from the bed of the Garchary, one of the higher sources of the Dee, where it flows past the side of the mountain of Carntoul."

In another article we will select a few popular details respecting the modes of working the granite quarries of Aberdeen, and the manner in which London has so long been supplied with paving, and now with building stone, from this abundant source. For the present we conclude with the just remarks of Dr. Knight on the importance of selecting durable materials for our public buildings and monuments, which ought to transmit to distant ages memorials of the wisdom as well as the piety of those who erected them.

The more that we return to the practice of the ancient Egyptians, Greeks, and Romans, in paying very great attention to the material of which grand edifices and public works are constructed,—a return now, after long delay, happily begun in this country,—the more will the Aberdeen granite be valued. Were St. Paul's to be now erected, it would not probably be built of a limestone of so loose a texture as to have lost upwards of an inch over all its surface, washed off by the rains in the course of a century and a quarter, and of which the quarries in the Isle of Portland did not supply blocks of sufficient dimensions to allow Sir Christopher Wren to form one row of columns in the grand front of the church, but obliged him to have recourse to two orders, with all the accompanying train of evils. Nor would Henry the Seventh's Chapel have probably undergone, in our own time, that complete repair which it received by enormous parliamentary grants expended on renewing its exterior with the same oolitic limestone which was employed in the age of its founder. The ornamented buttresses, lately completed, are already smoked, and will soon follow the fate of their predecessors, and fall into undistinguishable masses of ruin. The renovation of this noble structure has doubtless been complete for the time; but how superior would it have been, had a durable material been used in a structure where the very great expense of what has been done, would have, at least, sanctioned the same expenditure in what would have possessed a permanent character! If Bath stone hardens in the air, it is only the forerunner of a more speedy dissolution. In considering every stone for the purpose of building, a knowledge of its mechanical structure, and of its chemical nature, must be united. Few are the architects who have attended to this subject, any more than to the arrangement of the interior of churches and public buildings, so as to be best adapted for hearing sounds*.

* From an Essay by Dr. Knight on the *Granite Quarries of Aberdeen*, published by the Agricultural Society of Scotland, from which we have selected the most popular details.

PHILOSOPHY, as well as medicine, has plenty of drugs, a few good remedies, but scarcely any specifics.—CHAMFORT.

BE kind to your friends, that they may continue such; and to your enemies, that they may become your friends.

THE KITCHEN GARDEN.

III.

MARCH.

'Tis pleasant on each hardy tree,
Currant, or prickly gooseberry,
Along the hawthorn's level line,
Or bush of fragrant eglantine,
Bramble, or woodbine's twisted trail,
Or willow lithe, a *flush of green*,
To note. MANT'S *British Months.*

AMONG the numerous employments of the gardener during the busy month of March, is the sowing or transplanting of asparagus, to which delicate vegetable a large space is usually allotted in a gentleman's garden, while it is rarely seen near the dwellings of the poor.

The name of this plant is of Greek origin, and is handed down to the present time in the writings of Dioscorides; but the ancients were accustomed to bestow the same appellation on all young sprouts of vegetables; therefore it is not always easy to ascertain the particular kind of which they are speaking. With the Romans asparagus was a favourite vegetable, and they appear to have been possessed of a very strong-growing variety, and also to have been well skilled in its cultivation, for Pliny, describing the asparagus grown in the neighbourhood of Ravenna, says that three shoots would weigh a pound, whereas with us six of the largest would be required. In the writings of Cato, the cultivation of asparagus is enlarged on in a manner that would lead us to suppose it must have been of recent introduction.

Asparagus is found growing on the borders of the river Euphrates, where it attains a very large size. Many of the steppes in the south of Russia and Poland are also covered with this plant, which is eaten by horses and oxen as grass; but in this situation it is so dwarfish that an ordinary observer would scarcely recognise it as the same species with our cultivated asparagus.

Until the end of the seventeenth century very fine asparagus was largely imported into this country from Holland. The rich moist soil of that land is favourable to the growth and perfection of the plant, and at the present time, the variety known as Dutch asparagus is distinguished for affording the thickest stems. But asparagus is a native plant in the British Isles. Wild asparagus grows in Essex and Lincolnshire; on the sea-coast near Weymouth; and also in the vicinity of Edinburgh, though it is otherwise rare in Scotland.

The cultivation of this vegetable cannot be recommended in an economic point of view. It affords but little nourishment, and is rather employed to promote than to satisfy the appetite. It is much more expensive to raise than those substantial vegetables, the leaves or roots of which are employed as food; for it is only a very small portion of the plant that is eaten, and that only when in a tender and undeveloped state. The roots of the asparagus penetrate deeply into the ground, and are not affected by the frosts of winter. They consist of fleshy knobs and tubers, which send out numerous shoots early in the spring: the tops of these shoots, as they rise a few inches above the ground, are the only parts used as food. A recent writer has well said, "There are few subjects in vegetable anatomy which display more beauty in their structure, than may be disclosed in a transverse section of a head of asparagus. The shoot of an asparagus grows only from the extremity, and works or vegetates from the centre, and not from the surface as in trees. Thus it pushes up through the soil *en masse*, if it may be so expressed. The branches which lie so thick together, safe and well protected under their scaly leaves, soon begin to be developed, and are drawn out until the whole plant, with its numerous thread-like leaves, assumes very much the character of a larch tree, having its miniature parts more light and elegant, and the colour of a more lively green. The flowers, which wave in graceful panicles, are of a yellow hue, and of a fragrant smell. They are followed by round berries of a bright orange-red. The head of the young shoot of asparagus is edible just as far as the part which is to flower extends; and thus one who eats a head of asparagus eats in that little space the rudiments of many hundreds of branches, and many thousands of leaves."

Vast quantities of asparagus are raised for the supply of the metropolis; and as this delicate vegetable is often sold at a very high price, it is a source of great profit to those who raise it in extensive plantations of from fifty to one hundred acres in extent. Of the varieties cultivated near London, the Battersea asparagus is distinguished for large, full, close heads, and a reddish tint, and is much in request among market-gardeners. Gravesend asparagus is smaller, and more green-topped, but is reckoned of finer flavour than the preceding. Giant asparagus, the shoots of which are sometimes of immense thickness, is greatly admired for its size and weight: sixty shoots have been found to weigh nearly seven pounds.

Asparagus is a hardy plant, constantly producing ripe seeds every autumn, from which it is cultivated. The seeds from the strongest and finest shoots are taken when quite mature, and of these a pint is sufficient to sow a bed thirty feet long by five feet wide; that is to say, if the bed is intended to form a permanent plantation; but the more usual plan is to transplant the asparagus after one or two years' growth.

The middle of March is the season when, if the weather be favourable, the sowing of asparagus is carried on. It is sown either broadcast or in drills, according to the fancy of the cultivator. The soil of the seed-bed must be good, and kept free from weeds, and at the same period in the following year, strong plants will be produced, ready to be permanently placed out. Asparagus beds are carefully prepared in a light rich soil, with abundance of manure; for although the plants grow naturally on a poor sandy soil, yet their value as a culinary vegetable entirely depends on the rapidity with which they are raised. The soil should not be less than two and a half feet deep, and the alleys which divide the beds should be sunk considerably below them to carry off the rain, a wet subsoil being extremely injurious to the plants. In planting out the young asparagus, a line is stretched lengthwise along the bed, nine inches from the edge, and a small trench made, in which the plants are set nine inches apart, with the crown of the roots two inches below the surface; the trench is then filled up, and another opened at the distance of a foot from the first. In this way three or four rows are formed, according to the width of the bed, after which the surface is dressed neatly, and if the weather prove dry, a little water is given occasionally until the plants are established. The crop is permitted for the first two or three years to run up to stalk; but the third year is generally that in which the asparagus bed arrives at maturity. When once come into bearing, the beds will continue to produce their annual crops, with only a little attention to weeding and manuring, for ten, twenty, or even thirty years.

Towards the end of March the sowings for the main crop of carrots generally take place. The carrot is an important culinary root, containing much nourishment; it is also an excellent agricultural vegetable. For its introduction into this country we are said to have been indebted to the Flemings, who in the reign of Queen Elizabeth sought refuge in England from the tyranny of their Spanish oppressor, Philip the Second. The emigrants first began to cultivate the carrot in the neighbourhood of Sandwich, in Kent, and the English, who were yet but scantily supplied with culinary vegetables, appear gladly to have welcomed this novelty, so that the carrot quickly became the object of careful culture throughout the land. The leaves of the carrot are light and feathery, and the small white flowers grow in umbels. Though little noticed in the present day the leaves were greatly admired when the carrot first came

into cultivation, and ladies occasionally employed them as a head-dress. Parkinson, a celebrated botanist in the time of James the First, mentions this custom, and if these delicate leaves were not so perishable, and were also somewhat less odorous, there would be nothing to object to in the taste shown by the ladies of that period in substituting this head-dress for one of feathers, or flowers. A winter ornament for rooms is still occasionally formed by cutting the crown from the thick end of a carrot, and placing it in a shallow vessel of water. Tender leaves are soon developed, and thus a little tuft of verdure may be obtained at a time when green leaves are peculiarly pleasing to the eye.

Carrots require a light sandy soil, and this should be prepared eighteen inches deep, with manure at the bottom. The mould should be as fine as possible, and quite clear of roots and stones, which hinder the perpendicular descent of the carrot, and force it into a branched or spiral growth, thus deteriorating its value. The orange or long carrot is the kind preferred for the main crop in gardens, having a more delicate flavour than the red carrot which is usually employed in fields.

The seeds of the carrot are armed with forked hairs, and therefore cling together. To remedy this, they are mixed with a little dry sand or wood ashes, and rubbed between the hands to separate them. They are usually sown upon beds three or four feet broad, and raked in smoothly and evenly with a wide rake. Some gardeners prefer sowing them in shallow drills, ten or twelve inches apart, leaving room to introduce the hoe betwe n the rows, and thus to keep the bed more easily free from weeds. When the young carrots are seven or eight weeks old, they are thinned out to four or five inches apart if intended for drawing young, and to eight or ten inches if designed to attain their full size. The second or third week in March, weather permitting, is the best season for sowing the principal crop of this useful vegetable. A large crop of carrots will prove no bad store. Should there be more than necessary for the supply of the family, the refuse of the garden w.ll be very useful where there are pigs, or poultry, a horse, or cow. It is somewhat remarkable that the milk of cows fed on carrots does not acquire any unpleasant flavour thereby, while at the same time the quantity is increased. Calves and sheep thrive well on this food, and hogs are speedily fattened by it. A spirituous liquor has been obtained from carrots, and attempts have been made to procure a beverage resembling beer, and likewise sugar, from this root. It has been even stated that eighteen tons of carrots, the produce of one acre, will yield one hundred gallons of proof spirit, a larger product than that obtained from an acre of barley. The ready-formed saccharine matter in carrots, is two and a half per cent. more than in barley, and six times more than the quantity contained in potatoes.

A still more nourishing and valuable root, but one that is less employed as a culinary vegetable, is the parsnip, of which the main crop is also sown about the second or third week in March. The parsnip, like the carrot, may be found growing wild in our fields, but is greatly improved by cultivation. The same mode of culture described for the carrot is likewise applicable to this vegetable. Sir H. Davy found in one thousand parts of parsnip, ninety-nine parts of nutritive matter, of which nine parts are mucilage, or starch, and ninety saccharine matter, or sugar. As a field vegetable for the use of live stock, the parsnip is equally valuable with the carrot, perhaps more so, and as a garden vegetable it is deserving of greater attention than it now meets with. Neill informs us, that in the north of Scotland parsnips are beaten up with potatoes and a little butter, making a most excellent mess, of which the children of the peasantry are very fond, and on which they thrive well. The vegetable was certainly better accounted of in former times than at present, and was by no means confined to its modern use, namely, that of being a mere accompaniment to salted fish, or other salted provisions. An agreeable soup is made by French and Dutch cooks from this vegetable: parsnip wine is also made in many places, and is one of the best and cheapest of home-made wines, and very easy of manufacture. It approaches nearer than any other wine to the Malmsey of Madeira and the Canaries. Marmalade, made of parsnips and a small quantity of sugar, is said to excite appetite, and to be a very proper food for invalids. A side dish has been sometimes introduced at the first tables, consisting of parsnips, first boiled, then dipped in thin batter of flour and water, or the white of eggs, and fried brown.

The latter end of March is also the time for sowing beet, and though this vegetable is not in great favour among us, it may be well to notice its nutritive qualities, and thus to draw attention to its cultivation and cookery. As it is at present employed, it is found so insipid as to be nearly disregarded, but if the skill of the cook could make it somewhat more savoury, it would form a valuable addition to our list of vegetables. According to Sir H. Davy's analysis, it contains nearly fifteen per cent. nutritive matter, which is more than any other root except the potato. One of the varieties of beet is called mangel-wurzel, and is well known for the amount of nourishment it affords to cattle. There is no reason why the cultivated garden varieties should not be equally important to man, if they could by any means be rendered pleasing to his taste. Red beet is the kind principally used in the garden. The root is in the form of a carrot, and is red throughout its whole substance. It is very juicy, and when sliced it gives out a juice of a beautiful purple colour. The leaves are large and long, and generally have a red or purple tinge. This vegetable is sometimes boiled, sliced, and served up warm with melted butter; but it is not very palateable. The green leaves are also dressed as spinach, which they much resemble in flavour. The fleshy leaf stalk has an agreeable flavour when boiled and served with butter. The more usual way of employing these roots is, after boiling, to leave them to grow cold, when sliced and eaten with vinegar they are agreeable in salads or otherwise. The author of the *Vegetable Cultivator*, tells us that a beet-root sliced up with a Reading or Portugal onion, boiled also in soft water, makes a nice condiment with cold meat, if mixed with spices and vinegar, and an egg or two boiled hard.

The beet (*beta*) takes its name from the shape of the seed-vessel, which, when mature, has the form of the letter so called in the Greek alphabet. This root was well known among the Romans, an accurate description of it being given by Pliny. The plant is a native of the sea-coast of the south of Europe, and appears to have been introduced into England at the same time with several other culinary plants, about the year 1548. It is perfectly hardy, and bears our climate well, in most parts of the kingdom. From one variety of beet-root, sugar is extensively prepared in France.

The cultivation of the beet is very simple. All the varieties are raised from seed sown in March or April, in the place where the plants are to remain. An open situation, and a rich, light, sandy soil, are best for the plant. The seed is sown thinly, either broadcast, or in shallow drills. The plants come up in a month, and are then thinned and weeded by hand. Ten or twelve inches is left between the plants each way.

The other operations of the month are chiefly the repetition of former processes. Beans, peas, lettuce, small salad, parsley, cabbage, turnips, onions, and sea-kale, are sown once or twice. Slips of herbs are put in, horse-radish and artichokes planted, peas and beans earthed up, early cabbages and autumn-sown lettuces transplanted, and general attention given to the soil, and to the removal of weeds and litter.

THE ATMOSPHERIC RAILWAY.

II.

"The air is cut away before,
And closes from behind."—COLERIDGE.

WITHIN the pipe described in a former article is a piston, with a rod fourteen or fifteen feet in length, to which are attached rollers for opening the air-tight valve at the rear of the piston, not in front, as it advances along the pipe. A "coulter" connects the piston to the driving car, as the first carriage is called; and to this car is connected a copper vessel several feet in length, heated with coke, for the purpose of melting the wax when the valve has been pressed down by the apparatus for that purpose (see fig. 1).

The reader is requested to bear in mind that the moving force depends upon the *difference* of pressure before and behind the piston. So long as these two forces are in equilibrium, they counterbalance each other; and there is no propulsive power. But disturb this equilibrium, destroy this balance of power, and we at once call into action an existing, but hitherto dormant force, varying in amount with the extent to which the equilibrium has been destroyed. When, therefore, the vacuum-pump has exhausted the air in front of the piston to the extent of 15 inches by the mercurial gauge, there is a pressure in front of half an atmosphere, say 7½ lbs. to the square inch; but the pressure behind has not been disturbed; it is still a whole atmosphere, say 15 lbs. to the square inch; the propulsive force is consequently the difference between these, or 7½ lbs. to the inch. If the exhaustion in front is carried to 25 inches, the remaining pressure is 5 inches; and the difference, 20 inches, indicates a propelling power of two-thirds of an atmosphere, or 10 lbs. on each square inch of the piston, being half a pound for each inch of exhaustion shown by the mercurial vacuum gauge.

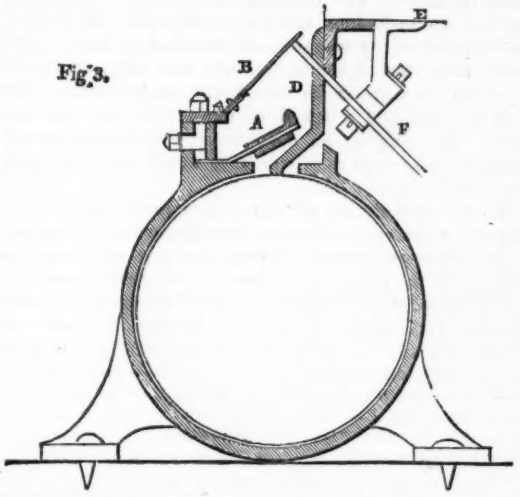
Now the sectional area of a circular piston, 15 inches in diameter, is about 176 inches. When, therefore, a vacuum has been produced of 10 inches, or a third of an atmosphere, there is a power of 880 lbs.; a vacuum of 15 inches gives 1320 lbs.; and a vacuum of 20 inches (which is readily attained) gives 1760 lbs.; and it is considered that the average traction power of a locomotive is about 1000 lbs.

We may remark, that as the area of a circle is in proportion to the square of the diameter, a pipe of 7½ inches in width would have a force equal to one-fourth that of a pipe 15 inches wide; a pipe of 5 inches would be only one-ninth, and so in proportion.

We have assumed the weight of the atmosphere at 30 inches, as shown by the common barometer, and the pressure at 15 lbs. to the square inch. These amounts, though not strictly accurate, are sufficiently so for our purpose. On some very fine day, when the barometer stands at 30 inches, (all barometers are thus graduated,) should the piston be loaded to the full extent of its traction power, and the weather changing very suddenly, the barometer should fall to 28 inches, (which is a possible, though quite improbable event,) the power of the piston would be forthwith lessened one-fifteenth. The pressure in front continues the same, but the hind force, the weight of the atmosphere as shown by the barometer, is two inches, or one-fifteenth, less than it was. We introduce this simply as an illustration of the principle of action, not as an event that will actually occur: though from time to time the variation in the weight of the atmospheric column, and consequently in the pressure on the piston, is greater than that we have named.

It will now be seen, that in the atmospheric railway the traction power depends on the sectional area of the pipe, and the amount of vacuum or rarefaction. The speed will be in proportion to the rapidity with which the air in front of the progressing piston can be drawn or pumped out of the tube. This exhaustion is easily carried to 23 or 24 inches, as shown by the mercurial gauge; (a perfect vacuum being 30;) it is nearly simultaneous in the whole length of the pipe, and an exhaustion of 15 inches has been procured in less than two minutes. A speed has been attained of 50 or 60 miles an hour, and even 80, with a single carriage; and at this rapid rate the sealing apparatus performed its duties perfectly.

Fig. 3.



Transverse section of the Vacuum Pipe, with the valves open.

A The air-tight valve.
B The weather valve.
D The connecting arm or coulter.
E Part of the driving carriage.
F Roller to open the weather valve.

To prevent confusion, the rollers for opening the air-tight valve are not shown in this drawing; they may be seen in the longitudinal section placed at the head of the previous paper; in which the piston A is seen travelling in the direction of the arrow. As it advances the two small rollers B B lift up the air-tight valve, which, when the coulter F has passed, is allowed gradually to fall into the groove again, by the corresponding rollers C C, and is firmly pressed down into its right position by the upper roller D. The long heater E follows, and melting the wax (shown at C, in fig. 2), re-seals the pipe; F is the connecting arm or coulter; and G is the weight to counterbalance the piston. Between the carriage wheels is shown the seat for the conductor. (The roller for opening the weather valve will be seen in fig. 3.)

The pipe at the higher end is connected with a large air pump, worked by a stationary engine at Dalkey, for the purpose of exhausting, or more correctly, partially exhausting, this pipe, and thereby causing, as we have before explained, a pressure at the opposite end. This pump is about 5½ feet in diameter, or nearly twenty times the sectional area of the pipe: the length of the stroke is also about 5½ feet, and when working it moves at the rate of 240 feet per minute. It is double-acting.

Now the carriages being attached to the piston at Kingstown, and the air being pumped out of the tube, it is clear, that if the pressure is sufficiently great on the piston, the driving carriage must go forward. The train moves—the driving car, or piston carriage, opens the sealed valve—the apparatus for this purpose again presses the valve into its proper channel—the heater follows and seals it up—the engine continues to work the air pump, to maintain the partial vacuum—the train arrives at its destination—and the pipe is ready sealed for a repetition of the same process.

The return voyage is to be performed without any power save that of gravitation. The carriages are to convey themselves down the line, and also the piston,

which not being needed in the descending journey, is placed outside, as horses are sometimes taught to mount a low truck when their power is not wanted. This contrivance also saves a needless working of the valves. On such an incline, (an average of 1 in 115, in some parts much steeper,) this will be easily effected, at a rate probably of 20 to 30 miles an hour. The writer of this article was, some time since, on a line of railway, which, though not designed for passengers, was in very good condition; and wishing to proceed four or five miles down an incline, much less steep than the Dalkey Railway, an empty waggon was attached to two loaded ones; they started, the motion was very easy, and as he stood on the waggon he found, very unexpectedly, that they had attained a speed of more than 30 miles an hour: Standing on an open truck, this was an unwarrantably dangerous rate, which he would not knowingly have attained.

To this description of the Atmospheric Railway we will add a few words relative to its history and progress.

The first suggestion of such a mode of transit is attributed to Papin more than a century since. In recent times have followed Lewis, Vallance, Medhurst, Pinkus, and lastly, Clegg and Samuda. Professor Vignoles states, in 1842, that it was "Medhurst who, about thirty years since, first gave to the world the right idea of connecting the body in the pipe or tube, directly acted upon by the atmospheric power, with a carriage moving along exteriorly." He published several pamphlets on the subject, which did not attract much attention.

Mr. Vallance took out a patent, we believe, in 1824, and he constructed a pneumatic tunnel at Brighton, of about two hundred yards long, for experimental purposes, of sufficient capacity to contain a passenger carriage.

In 1834 Mr. Pinkus took out a patent, adopting the small tube suggested by Mr. Medhurst, and proposing to cover the aperture in the pipe with a rope. This plan, as we have stated, was not found sufficiently air-tight.

Lastly came Mr. Clegg, who, still adopting Medhurst's small tube, patented the beautifully simple apparatus which is the subject of these papers; and which is said to be quite calculated to endure the rough usage necessarily attendant on so rapid motion.

The half mile of experimental line erected on this principle, at the expense of the patentees, on the West London Railway, had been exhibited for many months without attracting much attention, when it was seen by James Pim, Jun., Esq., the Treasurer of the Dublin and Kingstown Railway, who at once warmly espoused the cause of the patentees, and addressed a letter to the President of the Board of Trade, urging the railway department of that board to institute due inquiry into this new application of the atmospheric pressure. He says, "This claim is not made lightly, nor without a suitable feeling of responsibility: it has resulted from a careful and prolonged investigation, and from repeated experiments on the West London Railway, in which I have been assisted by many of the most distinguished men of science, and by several eminent practical engineers; whose concurrent opinions have led me to such a perfect conviction of the importance of the subject, as to induce this application."

He was successful; and the commmissioners' report was so far satisfactory, that, as we have stated, Government consented to advance the money.

We should not omit to add, that the electric telegraph, by which signals can be transmitted with the speed of light itself, is to be a companion of the atmospheric railway.

Several distinguished foreigners have visited Kingstown; and M. Mallet, who was appointed by the French Government to visit the Dalkey line, has presented a report to the Minister of Public Works, recommending the government to construct a line of several miles in length, so as to require three or four stationary engines, for the purpose of testing the value of the invention, as he considers the future prospects of railways in France greatly concerned in the question.

AN ACCOUNT OF THE DRUNKEN SEA.

BY JAMES HENRY, M.D., FELLOW OF THE COLLEGE OF PHYSICIANS, DUBLIN.

NOTHING can exceed the beauty of the Drunken Sea from the beach of Soberland, where you take shipping, as far as Point Just-Enough. The clear and smooth water is scarcely so much as rippled by the light breeze which wafts from the shore the fragrance of a thousand flowers. No mist ever broods upon the water, no cloud overcasts the soft blue sky. The glorious image of the sun by day, the silvery face of the moon by night, are no where seen to so much advantage as in the mirror of Pleasant Bay, for so this part of the Drunken Sea has been most appropriately named. The current being always towards Point Just-Enough, and the wind, if you can apply that name to the gentle breath which no more than fills your sails, always in the same direction, the passage is so smooth and easy that it not unfrequently happens that the voyager finds himself close upon the Point almost before he is aware that he has left Soberland.

The voyage is usually performed in boats made out of porter hogsheads, or wine pipes, or spirit puncheons. It is astonishing what excellent sailing boats these vessels make, when divided longitudinally, and furnished with sails and oars. Riches having the advantage every where, upon the Drunken Sea as well as upon land, the boats which are used by the rich are much more elegant, easy, and commodious, although, perhaps, not faster sailers than those which are used by the poor. Besides the fares there are certain tolls payable by all persons who sail upon the Drunken Sea. These tolls are so considerable as to form a principal part of the revenues of some of the imperial governments of Soberland. Notwithstanding the expense which is thus necessarily attendant upon sailing on the Drunken Sea, the number of persons, rich and poor, who sail upon it exceeds all calculation; the rich paying the expense out of their superfluities, the poor out of their necessaries. Some, however, insist that in the end the poor bear the whole expense, and pay out of their necessaries for the rich man's voyage as well as their own.

The voyage to Point Just-Enough becomes more and more agreeable the nearer you approach the Point. The air becomes still more soft and balmy, the blue of the sky and water still more delicious, and even the sombre objects of Soberland, now somewhat in the distance, seem to acquire a certain mellowness and splendour from the new medium through which they are seen. In the meantime a corresponding change takes place in the passengers themselves; they experience an agreeable sensation of warmth, commencing at the pit of the stomach and gradually extending from thence over the whole body; their pulse beats quicker and stronger; their breath acquires an agreeable odour, not unlike that of the sea on which they sail; their eyes become brighter and softer, and sometimes even seem to sparkle; their cheeks flush a little; their hands are sensibly warmer to the touch; their looks and gestures become animated; they feel increased strength and courage and readiness for action; their ideas succeed each other with great rapidity and vivacity, and are a little less obedient to the will; they become less careful and anxious, less precise and particular; regard themselves with more complacence, their neighbours with more charity; gentlemen become less solicitous about the set of their cravats; ladies, of their caps and collars: all become less serious; less disposed to deliberate; less inclined to prayer, or any other solemn religious duty; less scrupulous about right and wrong; less tight-laced; not so very sober; more gay, good-humoured, frolicsome, frivolous; more inclined to singing, jesting, and light conversation; more voluble, energetic, eloquent; more ready to tell secrets, either of their own or their neighbours; more inclined to quarrel suddenly.

All voyagers to Point Just-Enough agree in the account which they give of their passage across Pleasant Bay, and of the agreeable sensations experienced on approaching the Point; but they disagree very much in their statements respecting the Point itself; some say that it is further off, others that it is nearer; some that it lies more to the north, others more to the east; many assert that it recedes as you approach it, while some maintain that it moves forward, and comes to meet you before you have more than half crossed Pleasant Bay. These conflicting statements may, perhaps, be reconciled on the supposition, which seems far from unreasonable, that Point Just-Enough is situated in a floating island, which, shifting its position from time to

time, is sometimes nearer, sometimes more distant; sometimes a little more to the north, and at other times a little more to the east. However this may be, the visitors to Point Just-Enough all agree in stating that it is quite impossible either to come to anchor off it, or to effect a landing upon it; the water being so deep that no anchor will take the ground, and the current so rapid as to carry you past the Point before you can secure a boat to it by any grapples which have yet been invented. For these reasons all skilful sailors, the moment they arrive at Point Just-Enough, instead of vainly attempting to come to anchor or to land, tack about and steer back again across Pleasant Bay for Soberland, thus avoiding the danger of being carried by the force of the current further on into the Drunken Sea, and perhaps thrown upon an island called Tipsy Island, lying at no great distance to the leeward.

The great unwillingness with which all the visitors to Point Just-Enough allow the sailors to tack about and steer homewards, has given rise to an opinion that if a landing upon the Point were practicable, every visitor would settle there permanently, and bid an eternal farewell to Soberland.

The voyage homewards from Point Just-Enough is much less agreeable than the voyage outwards; the air gradually loses its balminess, and the landscape its brilliant colours; the current and wind, too, although gentle, yet being against you, make it necessary to tack, and thus render the passage tedious. There are few who do not experience as they return some diuretic effect, as well as a slight degree of thirst, the latter of which continues after landing, and even until bed-time, unless removed by tea or coffee. The night's sleep is less soft and refreshing, but at the same time heavier than if no visit had been paid to the Point in the day; and on awaking the next morning, a degree of languor is experienced, and sometimes even a little throbbing at the temples, which symptoms, however, disappear either during the making of the toilette or soon after breakfast, and are succeeded by a strong desire for another voyage to Point Just-Enough. This desire being gratified with as little delay as possible, the same sensations are experienced, and the same consequences ensue, and thus a habit is formed which increases in strength, until at last a daily visit to Point Just-Enough comes to be considered almost as a necessary of life.

Pleasant Bay is therefore covered from early morning until a late hour at night with boats conveying passengers of all ranks and descriptions to Point Just-Enough and back again. The intercourse is however by far the greatest from dinner-hour until tea-time, the evening being generally considered the most fashionable as well as the most convenient and agreeable time for the voyage. Some dine before they set out, but the greater number take their dinner on board. Among the visitors to Point Just-Enough there are a few who go very irregularly and at long intervals, others who go only every second or third day, and some only on the Sabbath day; but the great majority, unless prevented by illness, go every day of the year at the same hour, and never allow either business or pleasure, or even bankruptcy or insolvency, or trouble or the death of friends or relatives, to interrupt the regularity of their daily sail across Pleasant Bay. Kings and queens, lords and ladies, knights and members of imperial legislatures, professors of all arts and sciences, merchants, traders, artisans, and even those who subsist upon charity, are to be found among the daily visitors to Point Just-Enough; the Christian, the Jew and the pagan; the white, the black and the olive; the democrat, leveller and aristocrat; the busy as well as the idle, the wise as well as the foolish, the learned as well as the ignorant, the grave as well as the gay, the young as well as the old. Parents bring their children with them, and teach them to navigate the Drunken Sea, as birds teach their young to fly. Employers bring their workmen, and masters their servants; the latter however require but little teaching, having generally had the advantage of an early apprenticeship to the art.

It is worthy of remark, that of the countless multitudes who daily sail upon Pleasant Bay, there is not one who can be persuaded that it forms a part of the Drunken Sea. It is also remarkable, that every one of those who make a daily practice of sailing upon this bay, acquires an invincible dread of water, and cannot be prevailed upon to drink it unless when sick.

It has been observed besides, that with the exception of man, all animals have an antipathy to the Drunken Sea, and cannot, without great difficulty, be persuaded to navigate even that part of it called Pleasant Bay. From this fact some naturalists have deduced a distinctive character of man, and instead of describing him as an animal, erect, biped, rational, with teeth intermediate between gramivorous and carnivorous, define him simply, an animal which sails upon the Drunken Sea.

The longitude and latitude of Point Just-Enough never having been exactly ascertained, either from its being situated, as already mentioned, in a floating island, or whatever other cause, geographers have found it very difficult to assign the precise limits of Pleasant Bay. It is, perhaps, to get rid of this difficulty, that some geographers describe Pleasant Bay as extending the whole way from Soberland to Tipsy Island. But whether it be or be not geographically correct to apply the name of Pleasant Bay to that part of the Drunken Sea which lies between Point Just-Enough and Tipsy Island, it is quite certain that there is no part of this sea where the sky is so bright, the air so fresh and exhilarating, or the motion of the water so lively and buoyant as it is here. It happens, therefore, as might be expected, that many of those who leave Soberland, with the intention of going no further than Point Just-Enough, do yet, when they arrive at that point, extend their voyage to Tipsy Island, tempted by the increasing beauty of the scene, the favouring wind and current, and the easy landing which the shore of the island presents at no great distance. Besides those who thus voluntarily extend their voyage from Point Just-Enough to Tipsy Island, there are others who, over-shooting the Point either through ignorance or inadvertence, miss stays in their attempt to tack, and are carried to the island by the force of the wind and current.

As it generally happens that those who have once visited Tipsy Island in either of the ways just mentioned, soon return to it again, direct from Soberland, and repeat their visits with great regularity during the remainder of their lives, Tipsy Island is always full of visitors. The sensations experienced on this island differ only in degree from those which are felt at Point Just-Enough. The pulse and heart beat a little quicker and stronger, the eyes become brighter, the skin hotter, the face more flushed, the voice louder, the gestures more vehement, the conversation less connected, the ideas rambling and incoherent. Some dance, some sing, some swear, some fight, all stagger about; some become loyal, others patriotic, some poetical, others philosophical; all are veracious, disinterested, magnanimous, chivalrous. It is usual to remain several hours, and even to pass the night upon the island. A few remain upon it for several days together; but as it is considered discreditable to be seen upon it in the morning, those who regard appearances usually leave for Soberland some time before day-break; many fall asleep on the island, and are carried in that state to their boats. In the morning all awake unrefreshed, with a parched mouth, hot skin, red eyes, aching head, and no appetite for breakfast, and spend the day drinking soda water at the great fountain on the quay of Soberland, which looks towards Pleasant Bay, and longing for evening in order to return to Tipsy Island, or at least as far as Point Just-Enough.

Tipsy Island is said to have been first discovered by Noah, who planted vines upon it. It was afterwards sacred to Bacchus, whose temple, situated about the middle of the island, is in a high state of preservation. It has been visited by Alexander the Great, and most of the illustrous men both of ancient and modern times, the names of many of whom are to be seen, carved with their own hands, upon the bark of the vines. Its daily visitors sing a song which runs nearly as follows:—

The Sea, the Sea, the Drunken Sea;
The blue, the fresh, the ever free, the ever free.
Without a mark, without a bound,
It runneth the earth's wide regions round:
It plays with the soul, it mocks the skies,
Or like a cradled monster lies,
  Or like a cradled monster lies.

I'm on the sea, the Drunken Sea;
I am where I would ever be,
With heaven above, and hell below,
And ruin wheresoe'er I go.
If a storm should come, and awake the deep,
What matter, what matter, I shall ride and sleep,
  What matter, what matter, I shall ride and sleep

I love, oh how I love! to ride, to ride
On the fierce, foaming, maddening tide;
When every wild wave drowns the moon,
Or whistles aloft its tempest tune;
And tells of Soberland far below,
And how on the Horrors the storm doth blow,
And how on the Horrors the storm doth blow.

I never was on the Sober shore,
But I loved the Drunk Sea more and more,
And backwards flew to her billowy breast,
Like a bird that seeketh its mother's nest.
And a mother she was, and is to me,
For I was born, was born on the Drunken Sea.

The waves were white, and red the morn,
In the noisy hour, in the noisy hour, when I was born;
The storm it whistled, the thunder rolled,
And the lightning seamed the skies with gold.
And never was heard such an outcry wild,
As welcomed to life the Drunk Sea's child,
As welcomed to life the Drunk Sea's child.

I have lived since then in calm and strife,
Full fifty summers a jovial life,
With wealth to spend and a power to range,
And never have sought or sighed for change;
And death whenever he comes to me,
Shall come, shall come, on the Drunken Sea,
Shall come, shall come, on the Drunken Sea.

Navy and regimental messes have too often been held upon this island, and there is no part of the world where the point of honour is so strictly observed, or so many duels fought. It is here that White Bait and other ministerial dinners, election treats, Lord Mayors' feasts, and Sheriffs' breakfasts are given. Barristers sometimes dine here when upon circuit, and medical consultations have been held here. Great discussions on politics take place here, and many famous speeches of members of imperial legislatures have been composed, and not a few of them delivered in this place. There are several magnificent race-courses on the island, and gaming tables on new and improved principles. It is also the favourite resort of pirates and smugglers, robbers, burglars, and murderers, who have performed some of their most famous exploits upon it. As there is no church nor other place of religious worship on the island, none but the most abandoned are seen upon it during church hour on the Sabbath day; soon after church hour the boats begin to arrive, and continue arriving until a late hour on the Sabbath night.

It is impossible to mistake the habitual visitors of Tipsy Island, when you meet them any where in Soberland; their hands are tremulous; their eyes muddy; those parts of their face which should be white are red, and those parts which should be red, and particularly their lips, are blue and purple; they are consumed by an unquenchable heat and thirst; have little or no appetite for solid food; are infirm in their gait, either attenuated or bloated in their form, fretful, timid, irresolute of purpose, apprehensive of evil, and have no disposition for useful and active exertion, nor any taste for virtuous society or intellectual enjoyment. Ten thousand millions of money are annually expended in loss of time upon the Drunken Sea and Tipsy Island, paying the tolls and fares, manufacturing porter hogsheads, spirit puncheons, and wine pipes; and supporting workhouses, jails, penitentiaries, and penal settlements, police commissioners and policemen, stipendiary magistrates, dispensaries, hospitals, and lunatic asylums for the use of the visitors of Tipsy Island.

Over against Tipsy Island on the mainland, and about a league beyond Point Just-Enough, is the port of Paphos. Many of the boats touch here as they return from the island. Malaria is prevalent in this port. The hospital, which is a very large building, and always full of patients, is situated on a hill immediately above the port, and commands a fine view of the Drunken Sea.

Off Tipsy Island, on the side furthest from Paphos, are three sunken rocks called the Horrors. The visitors to Tipsy Island are frequently dashed on these rocks by an eddy or whirlpool which surrounds them, and sucks in every boat that comes within a certain distance. Dreadful as is the fate of those who perish at once by this accident, that of the survivors is worse; the strength of their muscles is gone! their stomach rejects its food; their memory and perception are impaired; they are careless and indifferent about their property, friends, and nearest relatives; they are haunted by vain terrors, and not unfrequently imagine that dead or absent persons are present and talking with them; imbecile alike in body and mind, they have no happiness but in Tipsy Island, which they never cease to visit, until sooner or later they are again drawn in by the whirlpool, and dashed to pieces upon the same rocks upon which they had so nearly perished before.

On the same side of Tipsy Island as the Horrors, but a little further out in the Drunken Sea, are the Liver Sands. These are the more dangerous, because the precise point where they begin or where they end has not been exactly ascertained. Many of the visitors to Tipsy Island, in their attempts to keep clear of the whirlpool and the Horrors, run aground upon the Liver Sands; all such become yellow in the skin, hard in the stomach, swelled in the legs, and die dropsical; effects not unlike those which are produced by twenty years' residence in India.

It is remarkable that those who sail on the Drunken Sea in boats made of spirit puncheons, more frequently strike upon the Horrors, or run aground upon the Liver Sands, than those who sail in wine pipes or porter hogsheads. The superior safety of the two last mentioned classes of vessels is, however, counterbalanced by their peculiar defects; porter hogsheads in particular not only dull the wits and bloat the bodies of those who sail much in them, but are besides so heavy and unpleasant sailers, and produce so much biliousness and sea sickness, that many persons say they would rather not sail at all upon the Drunken Sea than go in them; while, on the other hand, the wine pipes are infested by a venomous insect, from which no degree of care can keep them free. This insect, which closely resembles the common bug, is generated in the lees of the wine, and, like the bug, hides itself in the crevices of the wood, from whence issuing out unobserved, it bites somewhere about the great toe. The pain and swelling which follow its bite are very considerable, extending to the foot, and even to the entire limb. Those who have been frequently bitten by it, have their legs swelled so as to resemble elephant's legs, are very irritable and choleric, and subject to fits of indigestion and apoplexy, which sometimes prove fatal in the course of a few hours. The antidote to the bite of this insect consists in drinking a large quantity of water, and never again sailing upon the Drunken Sea. It is, however, seldom used, as the bite of the insect has the property of communicating along with the poison an invincible repugnance to the antidote. For this reason few who have been bitten by this insect ever recover.

For some distance all round the Horrors, and on the Liver Sands, the sea is dark and rough, the winds loud and boisterous, and the sky overcast with clouds, which not unfrequently overshadow a great part of Tipsy Island. When you pass this island, and advance further into the Drunken Sea, the water becomes still darker and rougher, the winds more loud and boisterous, and the clouds which overspread the sky more black and lowering. Continuing to proceed, you enter into a dense fog called Fatuous Fog, which reaches from the water quite to the clouds, and shuts in the view in every direction. Immediately on entering this fog, the compass ceases to point, and whirls round incessantly with a rotatory motion upon its axis. Navigation being thus rendered impossible, it rarely happens that a boat which has entered Fatuous Fog is ever seen again. The few travellers who have ever emerged from it having been found to be either insane or idiotic, have been received into a lunatic asylum which stands upon a little point of land running into the sea, opposite to Paphos and Point Just-Enough. Beyond Fatuous Fog, and forming the extreme limit of the Drunken Sea, there is a range of very high and inaccessible mountains, called the Mountains of No-Hope. At the foot of these mountains the sea beats with inconceivable fury, throwing up from time to time human bones and fragments of wrecked and foundered vessels.

The boatmen believe that somewhere under the Mountains of No-Hope there is an outlet through which the waters of the Drunken Sea disgorge themselves into the abyss of ——!

[Abridged from the Author's copy.]

JOHN W. PARKER, PUBLISHER, WEST STRAND, LONDON.